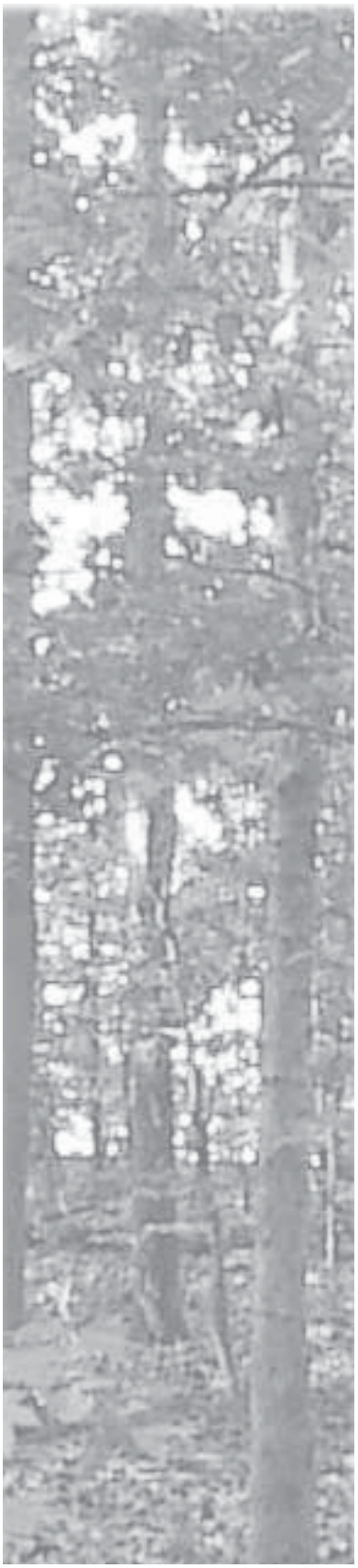
3.3 - General Woodlot Management


Alli Baird, CBLAD

Purpose:

The purpose of this chapter is to provide general horticultural guidance for local governments to help property owners maintain a healthy, functioning buffer. Management of the riparian buffer is often necessary to maintain the vegetation in the best health so that it can continue to function properly and provide the required water quality benefits. A riparian buffer is a living resource that changes over time. In order for property owners to manage their buffers, reasonable activity is allowed to the extent that it is necessary to assure the health of the forest.

This chapter is intended primarily for the residential homeowner, and for those whose property includes a wooded forest not intended for silvicultural activity. For legitimate silvicultural activities refer to Virginia Department of Forestry *Virginia's Forestry Best Management Practices for Water Quality,* 4th ed. for appropriate management techniques.

Regulations:

§9VAC 10-20-130.5.a states that:

"In order to maintain the functional value of the buffer area, existing vegetation may be removed, subject to approval by the local government, only to provide for reasonable sight lines, access paths, general woodlot management, and best management practices, including those that prevent upland erosion and concentrated flows of stormwater, as follows:"

(3)"Dead, diseased or dying trees or shrubbery and noxious weeds (such as Johnson grass, kudzu, and multiflora rose) may be removed and thinning of trees may be allowed, pursuant to sound horticultural practice incorporated into locally-adopted standards."


Alli Baird - CBLAD

A forest of mixed vegetation will help stabilize a bank by:

- retaining runoff
- preventing channelization
- increasing infiltration
- increasing soil strength
- maintaining sheet flow
- preventing erosion

DISCUSSION:

"A healthy forest can be defined as one with a majority of living trees that are a part of a functioning ecosystem."[1]

That ecosystem is a complex mix of trees, understory shrubs and groundcover. Over time the process of natural succession causes a change in species composition and structure. Small saplings are developing into the next generation of trees as the older ones die out, and understory trees add valuable functions between the larger dominant species. Despite the fact that fire, insects, disease, and natural disturbances such as ice and wind are a normal part of that successional process, in an urban setting, the effects of these natural forces may need to be monitored and controlled where necessary.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Fine organic debris and leaf litter is essential for retarding runoff, and providing carbon for denitrification.

A riparian, forested buffer may require some degree of maintenance to retain its health and function. Since a forest is a dynamic ecosystem, change is inevitable as vegetation grows and dies. Active management should, however, be based on sound horticultural practice to assure that unwarranted thinning or removal does not occur. The removal of noxious weeds, or dead, dying and diseased vegetation should only be done as necessary to maintain the health of the forest or to prevent fire fuel buildup problems. (For information on reducing fire risk, contact the Virginia Department of Forestry about their

Firewise Program: www.firewisevirginia.org). Removal of any material in the 25 feet closest to a stream should be avoided since the vegetation in this area provides the shade and organic material necessary to maintain the health of the aquatic habitat.

One of the important functions of this area of the buffer is that the roots of permanent woody vegetation helps to maintain the stability of a stream bank, minimizing bank erosion that contributes to instream sediment loading.[2] A wooded buffer with porous soil from leaf litter, fungi, twigs and associated bacteria, increases the ability of the bank to resist failure by enhancing infiltration, helping to decrease surface water runoff that can cause erosion.[3]

The root mass of woody vegetation also has value for nutrient retention, pollutant degradation, and denitrification aided by microbes associated with the roots. These functions cannot be entirely duplicated by herbaceous material such as turfgrass. Additionally, the deeper woody roots are more likely to intercept groundwater carrying pollution from inland sources and remove or convert nutrients, metals, and toxins before they reach surface waters.

In a forested area the roots, twigs, associated leaf litter and detritus are important for slowing stormwater runoff and trapping debris and sediment. The tree canopy is beneficial for attenuating the force of raindrops hitting soil and causing erosion. Raindrops that are intercepted are more likely to evaporate or infiltrate the soil, thereby reducing runoff quantity and rate of flow, producing potentially 30-50 percent less runoff than lawn areas.[4] "In addition to attenuating erosion, another advantage of the increased soil strength that roots impart is that surface soils become more resistant to channelization."[5] Maintaining sheet flow through the buffer is extremely important to gain the greatest value from the buffer. Sheet flow rates are generally lower which increases the probability of infiltration and allows sediment to filter out of runoff.

A forested buffer can help stabilize a steep bank. By helping to curb runoff and encouraging infiltration, erosive channels are less likely to develop and disturb the stability of the bank. Interlocking networks of woody roots provide significant value for soil stabilization, especially on sloping sites, as the roots extend deep into more stable subsurface soil layers. In older trees, the root system can extend as much as two or more times beyond the canopy of the tree, or the "drip line."[6] Before any tree is cut, all alternatives to removal should be explored. "…the practice of removing a majority of trees on a slope can greatly increase the probability of a slope failure in the future as the tree roots decompose and their soil-

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Decaying debris provides organic material for aquatic life, and creates instream habitats.

binding capacity declines."[7] The mass of roots, and associated bacteria and fungi that are part of a complex soil food web, improve the soil structure so that infiltration and water-holding capacity is increased and the soil maintains its structure. "…the overwhelming conclusion is that in the vast majority of cases, vegetation (especially well-rooted, mature trees) helps to stabilize a slope."[8]

Dead, diseased and dying Trees

Chris Schnepf, University of Idaho Extension, www.forestryimages.org

Rotting logs and other detritus provide nutrients, carbon and other organic enrichments to the soil.

In natural stands, dead and dying trees are a natural part of forest succession as it moves from pioneer to climax forest. Dead standing trees and logs on the ground provide food and shelter to many organisms and provide nutrients to the young forest vegetation as it grows. The carbon contained in the decaying material is a necessary part of the denitrification process, helping to remove nitrogen from the groundwater system. Leaf litter, twigs, and branches are an essential part of the buffer, functioning to retard run-off and return nutrients to the soil.

In the 25 foot area of the buffer next to the water, where dead or dying trees are the result of natural or physical causes (damage to roots, compaction of soil, toxins, wind or lightning), they should not be removed, unless they threaten to undermine the integrity of the stream bank or shoreline. If, for the health of the buffer, they must be removed, the stump and roots should be left in place to help bind the soil. For damaged trees that are otherwise healthy, leaving the stump may encourage new growth and regeneration, or "coppicing", to occur.

Robert F. Wilmer, Oklahoma State University, www.forestryimages.org

Shortleaf pine coppicing after fire.

Another important function of the area next to the water is to provide woody debris for habitat and decaying detritus that provides nutrients for plants and aquatic organisms. Woody debris that falls into a stream is one of the major factors in aquatic biological diversity promoting a variety of habitats as well as providing a source of slowly decomposable nutrients.[9]

Snags, or dead standing trees, offer nesting and perching sites for

many wildlife and bird species. If they are located where they won't be a danger to life or property, they should be left in place. However, in some instances, the dead or dying woody plants may be harboring insects or disease that require control before they invade other weakened plants in the buffer. Safety may dictate that dead trunks and logs need to be removed where they pose a fire or falling hazard.

Trees that are diseased or infested may have to be removed if the disease or insects threaten other trees and other control methods, such as chemical application, are likely to damage the adjacent waterway. An assessment by a certified arborist, degreed horticulturalist or forester would determine the severity of the problem and whether or not mechanical or chemical treatment might rid a tree or shrub of infestation, or if removal is the only option. Chemical use should be avoided within 25 feet of the water, since use in this area is more likely to result in the chemicals reaching the water.

All tree removal is subject to approval by the local government.

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Snags are preferred nesting site for some species of birds.

DEFINITIONS

Noxious weeds - vegetation that is physically harmful or destructive to living vegetation, especially to native species

Alien species - non-native species, differing in nature so as to be incompatible with native species

Invasive - tending to spread uncontrollably, overwhelming other, especially native, species; a native species may qualify as an invasive

Exotic - introduced from another country, not native to the place where found

Noxious weeds

Noxious weeds may be of concern when trying to promote a natural healthy native forest buffer. For the purpose of this section of the Regulations, "noxious weed " encompasses any invasive species that has gotten out of control and has become harmful to the health and survival of the woody vegetation in the buffer. This can include trees such as ailanthus or shrubs such as privets, as well as vines. Noxious does not mean "undesirable" or "obnoxious" plants. Control of non-native, exotic species, or even invasive native species, may be justified when they threaten to over-run or out-compete native trees and shrubs. Some common noxious species are Japanese honeysuckle, kudzu, mile-a-minute, multi-flora rose, English ivy, all privets, and winged euonymus. (For additional lists of invasive species see Appendix B: *Invasive alien species*)

JMV, Swearingen, USDA Forest Service, www.forestryimages.org

Ivy choking a tree

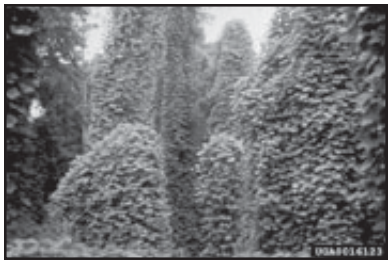
Not all alien plants are invasive all the time. If the noxious weed does not out-

Japanese honeysuckle may be invasive, damaging existing vegetation, but in some instances, such as on a bank where it is preventing erosion, it should not be removed without being replaced with appropriate erosion controlling vegetation.

compete the existing native species, does not alter the ecosystem, does not overtop existing species, adds rather than decreases diversity, or does not change the presence or density of existing species, then intense management or removal may not be necessary. If an invasive species is performing a desirable function such a preventing erosion on a bank, it should not be removed without replacing it with vegetation of at least equal value for erosion control and water quality functions.

The significance of impact on the site and the feasibility of control should dictate the management decisions. Careful planning and research may be required to develop the appropriate management tool for an invasive species. A variety of methods may have to be used depending upon the severity of the infestation. Mechanical control methods, such as pulling or cutting are the least disruptive to the environment. However caution is needed to prevent damage to valuable native species.

Poison ivy choking a tree



Kudzu is an aggressive alien invasive and requires severe measures to remove it from a site. If not removed by hand as soon as it is found, it may overtop and kill the existing vegetation. Removal and replanting of all vegetation may be necessary.

Preferrably, herbicide should be avoided to prevent damage to the underlying native vegetation. However, occasionally the tenacity of an invasive species may require chemical treatment. The choice to use herbicide treatment demands diligence in researching the appropriate product and method of application, for safety and effectiveness. Because of the dangers of unintended damage to non-target species, chemical use should be the choice of last or extreme resort. If it is determined that chemicals are necessary, owners are encouraged to consult with their county extension agent or other knowledgeable source to assure use of the appropriate

Over-crowding in a naturally regenerated stand may require thinning for the vegetation to develop into a healthy woodlot.

chemical at the correct rate. All manufacturers' recommendations and best management practices must be followed to assure the safety of the nearby surface waters.

Thinning

The use of the word thinning was to address the needs of silvicultural landowners to manage timber stands to maximize harvest. If a landowner has a buffer being managed as part of a timber stand, it is recommended that they contact a professional for advice on the best management practices to acheive this purpose.

Forested buffers in residential areas are generally not being retained as lumber stock for economic purposes, so thinning practices should reflect the value of individual trees and other woody vegetation as part of a functioning buffer, rather than as timber grown for economic gain. Thinning is distinct from pruning or removing vegetation to create a sightline or vista and is not the appropriate method to acheive those results. Residential thinning should only be done to improve the health and vitality of a wooded buffer to improve its water quality functions. It does not mean clear-cutting, removal of an even-aged class of trees, or removal of all trophic layers leaving only trees above a certain size.

Excessive removal of trees and all understory trees, saplings and shrubs is not acceptable and impairs the buffer functions. This should be considered a violation requiring replanting of understory shrub and groundcover layers.

Many woodlands have grown up after an open property has been abandoned, or after intense logging or clear-cutting, resulting in an even-aged stand that does not necessarily have plenty of young trees to grow and replace those that might die or be removed. Often trees in these naturally regenerated forests are poorly distributed, growing too closely together. This may result in overcrowding and competition for sunlight, water and nutrients, producing slow-growing, weakened trees that could be more susceptible to insects and disease. Additionally, years of neglect or poor

BEFORE THINNING CONSIDER THIS

Health: Dead, diseased, dying or weakened trees are preferred removal targets.

Age: A tree past maturity is a better candidate for removal than one in its prime.

Natives: Native species are more desirable and should be retained. Target non-natives and invasive species for removal.

Understory: Understory trees and shrubs are a significant part of a healthy self-regenerating forest and should not be removed. Native shade-loving understory trees and shrubs may decline if the canopy is removed, allowing invasives or other undesirable brush to flourish.

TREE CLASSIFICATIONS

In a typical unmanaged, even-aged stand of trees there will be six different classifications of trees:

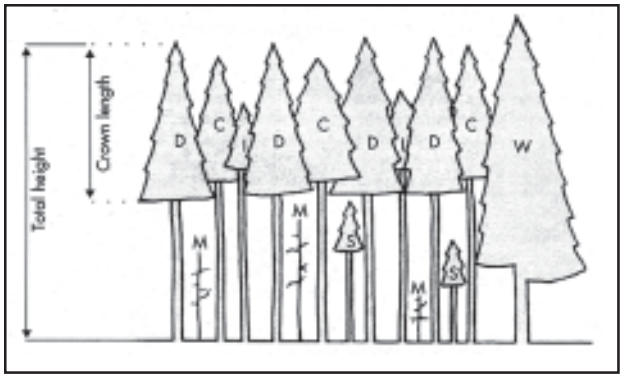
1) **dominant** are those that reach above the general level of the canopy and receive full sun from above and some on the sides;
2) **co-dominant** are those that form the general layer of crown cover, or canopy, receiving full light from above, but little on the sides;
3) **intermediate** are those that have crowns that extend into the general crown layer, but are crowded, receiving little light from above and none on the sides;
4) **suppressed** (or overtopped) are those that have crowns below the level of the crown canopy, receiving no light from above or on the sides;
5) **wolf** are trees that receive light on a full crown canopy and on two or more sides, usually in a mostly open space such as the edge of a forest.
6) **mortality** are dead trees within the stand; these are usually supressed trees or trees attacked by insects or disease.

management may have left only poor quality or undesirable species and a lack of young vigorous trees to replace those lost over time.

An evaluation of a woodlot may determine that thinning or an improvement cut may be a valid method for improving the health, distribution and species mix of a neglected stand. ***It is important to note that, in the practice of silviculture, harvesting or thinning trees is not planned in advance of the woodlot evaluation; the evaluation of the woodlot stocking determines the need for harvesting or thinning.***[10]

Response to thinning

Thinning of young dense forests may increase the growth of remaining young trees and allow selection of the most desirable mix of species. Most thinning is done for commercial purposes of encouraging rapid diameter growth in crop trees for timber harvesting. If the buffer is a dense forest of mixed-aged young trees, between 5-30 years old, and the crown ratio (length of crown in relation to height of tree) is 30 percent or more, thinning may improve the strength and growth of existing trees if they are currently crowding each other. This will release more of the light, water and nutrients for use by the remaining trees, so they should grow faster. It may also help to reduce insect and disease vulnerability by increasing tree vigor, as well as remove broken, deformed or otherwise weakened trees.[11] However, it does not mean remov-



Crown type classifications of trees in even aged stands. D= Dominant, C= codominant, I= Intermediate, W= Wolf, M= Mortality. The "crown ratio" is the proportion of total tree height that is occupied by live crown. In this illustration, the dominants have a 50 percent crown ratio: the wolf tree has an 80 percent crown ratio.*

*Emmingham, W. H., and N. E. Elwood. August 1983. Thinning: An important timber management tool. PNW 184. Pacific Northwest Extension, Oregon State University. p.4.

ing all understory trees, saplings and shrubs. They add significant value to the buffer and are not detrimental to the canopy trees in a buffer being maintained for water quality. The removal of understory trees and saplings will prevent the buffer from continually regenerating naturally over its lifetime.

> "***A cardinal rule when thinning is to improve the stand's condition for future growth.***"[12]
> ***Future growth should include regeneration within the buffer so that the woodlot is sustainable.***

It should be noted that stands that have not been actively managed before they are 15-20 years old generally do not respond to thinning with a significant increase in growth. If the remaining trees have less than 30% crown ratio or are shade-intolerant species, they may not respond positively to thinning and may even decline. Since timber harvesting would not be a goal of residential buffer thinning, the same standards for evaluation should not be used.

Another consideration may be the consequences of removing overstory trees. Understory shrubs that have been stunted in the shade may thrive when the overstory is removed and interfere with views as the shrubs grow higher and need frequent trimming. Other native shade-loving shrubs may become overstressed by excessive sunlight and give way to less desirable or weedy species if the adjacent protective overstory is removed. Non-native invasives that have been suppressed by overstory shelter may become prolific if the shelter is removed.

Competition within a stand

As an even-aged stand grows, some trees grow faster and out-compete the others: some become dominant while others fall behind to become co-dominant. The intermediate trees never managed to compete or are co-dominant trees that have weakened. The intermediates often become overtopped and die. On some poor sites the stand may become stagnant exhibiting slow growth and containing many suppressed trees. In an unmanaged stand the dead trees may remain in place to rot.

If a forest is managed early in its development, competition will be reduced and the majority of the trees will grow quickly into large trees with fewer becoming intermediates or suppressed trees.

Diameter limit*

Setting a minimum diameter, or caliper, for cutting is a poor woodlot management practice.

Cutting everything in a size class will include trees that are just beginning their optimal growth and may leave a woodlot without good quality trees for future seed sources.

A lack of reference to stocking rates in an evaluation of the stand may result in thinning that opens up the forest so much that regeneration may not result in a good growing stock for decades.

The best way to manage thinning or harvesting of timber is to measure the present stocking and compare to the ideal; then cut, or thin, trees from all size classes to bring the remaining stand as close to the ideal as possible.

Hilts and Mitchell.*The woodlot management handbook*. Firefly Books, Inc. 1999., pp. 126-127.

If the forest has been left to develop on its own, competition will cause all crown classes to develop, eventually. Removing only suppressed and intermediate trees will not have a big effect on the growth of the dominant and co-dominant trees, since suppressed and intermediate trees do not offer significant competition with the larger trees. Removal of some dominant trees may open the canopy and release some of the younger trees to growth. However, good quality trees should be left to provide seed for future generations. Even when thinning of some dominant trees is recommended, most of mature and aging trees should be left in the 25 feet adjacent to a stream to help maintain the health of the stream habitat.[13]

A typical natural forest will have a mix of 25% canopy trees, 25% subcanopy trees and large shrubs and 50% shrub/saplings.

Typical Tidewater forest composition

A typical forest in the Tidewater region has a mixed composition of tree classifications as well as a mix of trees, saplings, shrubs and groundcover. Proportionally, an undisturbed forest will have approximately 25% canopy trees (at ≥10 inch diameter breast height or dbh), 25% subcanopy trees and shrubs (at 4-10 inch dbh) and 50% shrub/saplings (at 1-4 inch dbh). While the total count of stems per acre varies from riverine to estuarine stands, the basal area remains similar at approximately 228.7 square feet per acre.[14] Young trees and seedlings, in the understory / subcanopy, are an indication that a forest is healthy and growing vigorously. A lack of these understory saplings indicates a forest that is not able to regenerate over time.

Woodlot evaluation

The local government must determine whether or not the proposed thinning is appropriate for a residential woodlot to improve the health of the stand. Consultation with a professional arborist or forester is recommended before approving any thinning activity. The arborist or forester should be able to examine a stand and determine whether or not a thinning will have any significant

benefit to the buffer. If thinning will not actively benefit the stand, then natural succession should be allowed to select the growth of the most vigorous trees. An evaluation should include an analysis of existing understory trees and shrubs, as well as subcanopy and canopy trees, since these are also important layers of a functioning buffer. The analysis should include the seedlings and saplings of understory and canopy trees so that species desirable for regeneration can be protected during management activities. Understory trees such as dogwood or redbud and a sapling and shrub layer are a natural component of a healthy forest that do not compete with the dominant trees. As part of a healthy, self-regenerating forest buffer, this understory layer offers other benefits as well for nutrient removal, soil stabilization and habitat.

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A healthy forest has a mix of trees and shrubs, and a variety of ages within the stand. This mix allows a constant renewal of the stand over time.

Under no circumstance should a complete understory layer be removed under the claim of thinning for management.

Healthy regeneration

In order for forested buffers to remain healthy, tree regeneration must be promoted through protection of existing understory trees. "…an undisturbed understory and forest floor should provide the next generation of overstory trees. In areas to be maintained as a light forest cover, the regeneration of shade tolerant species should be selectively promoted and protected when understory thinning operations are undertaken."[15] In a small residential buffer, individual trees should be identified as replacement for the overstory and protected during maintenance activities. A few high quality large seed trees should also be left as sources for future regeneration within the buffer. A mixture of native species should be encouraged, both understory and overstory, for a healthy future stand of trees.

James Sobinon, USDA Forest Service, www.bugsinimages.org

Damage from woodlot management may be more harmful than beneficial to the woodlot if damage like this occurs.

Tree protection

Protection of the remaining trees is an important part of any plans for activity in the buffer. "Light thinnings may do more harm than good unless the logging crew is very careful."[16]

Hardwoods are quite susceptible to insect and disease when bark is knocked off during thinning processes. This leaves the trees susceptible to bacteria, fungi and insects. "Removal of trees from a dense stand without damaging those remaining can be difficult and expensive, but the extra care required is a good investment in maintaining the health of the [remaining] trees…"[17]

Trees left behind after a severe thinning may be more susceptible to wind throw.

Stability

On slopes, larger trees will have the more extensive deeper root systems that are better for soil retention and slope stabilization. Removing the majority of healthy, well-rooted trees from a slope is more likely to increase the probability of slope failure. As mentioned in the section about dead and dying trees, the roots also help slow runoff, encouraging infiltration, so erosion is less likely.

Assessment of the stability of a tree in relation to surrounding trees and vegetation should also be taken into account. In a mature forest with trees growing within ten feet of each other with intermingled crown canopies, the trees generally function as a group. Removal of one or more trees, that are part of an interdependent group, may compromise the stability of the remaining trees.[18] Excessive tree removal within the stand may also subject the remaining previously stable trees to unusual wind stresses,[19] especially when on a bluff or other exposed situation.

Stream temperature is maintained by the surrounding buffer, helping to support aquatic organisims.

Stream temperatures

Another important function of the riparian buffer is the maintenance of stream temperatures that are necessary for the survival of aquatic species. However, the removal of 50% of the canopy cover over a stream may cause temperature fluctuations for four years in a first order stream adjacent to a cleared area such as a subdivision, meadow or agricultural field. The temperature of the groundwater effluent that enters a stream alters the temperature in the stream, so the loss of a forest adjacent to the buffer may have a greater effect if the density of a forested buffer is reduced.[20] In the area of the buffer adjacent to water, thinning should also be severely

restricted to removal of only those trees absolutely necessary to maintain the health of the forest.[21]

CONCLUSIONS:

- The goal of woodlot management should be to develop a self-sustainable, uneven-aged stand of mixed trees, shrubs and groundcover with a floor of either leaf litter and debris, or mulch.
- It is best to have a professional arborist, forester or other knowledgeable person evaluate the stand before any plans for removal of vegetation are developed for thinning or for removal of large infestations of pests.
- Should a woodlot be large enough that timbering is considered a legitimate silvicultural activity, the Virginia Department of Forestry should be notified before any activity takes place and operations should adhere to the *Virginia Forestry Best Management Practices for Water Quality*, Fourth edition.
- Thinning for woodlot management should only be considered as a management measure when:
    1) the buffer is a young forest that is a tangled jungle of dense vegetation, and an opportunity exists to encourage a selection of vigorous native species;
    2) the buffer is a degraded stand or an older stand that has been poorly managed or grazed in the past, and a thinning may be used to influence species composition, age and quality to achieve sustainability in the buffer.
- Thinning should only be done according to an approved plan based on recommendations of a professional arborist or forester, or as part of a Department of Forestry approved Forest Stewardship Plan.
- Under no circumstances should a complete age or size class, or trophic level of vegetation be removed under the claim of "thinning" or to achieve sight lines and vistas.
- The removal of noxious plants, which includes all plants on the Virginia Department of Conservation and Recreation's list of Invasive Alien Plants (found at http://www.dcr.state.va.us/dnh/pdflist.htm or in Appendix B

of this manual), is limited to those that have overrun an area becoming invasive, or are otherwise out-competing, or choking native plants.

- On first and second order streams, consider leaving dead trees, logs and other large woody debris within the 25 foot area closest to the stream. The availability of woody debris in this area is a major factor in aquatic biological diversity, providing slowly decomposable nutrients and a variety of habitats.
- Removal of leaf litter, groundcover or humus is not permitted.
- Removal of underbrush should be permitted only when it is dead, dying, diseased or infested, or if the material is a noxious weed.

RECOMMENDED PROCEDURE FOR LOCAL GOVERNMENTS:

Woodlot management may require anything from removal of a single dead tree to a complete removal of invasive and noxious species and replacement with native woody species. The procedure may vary depending upon the extent of the request.

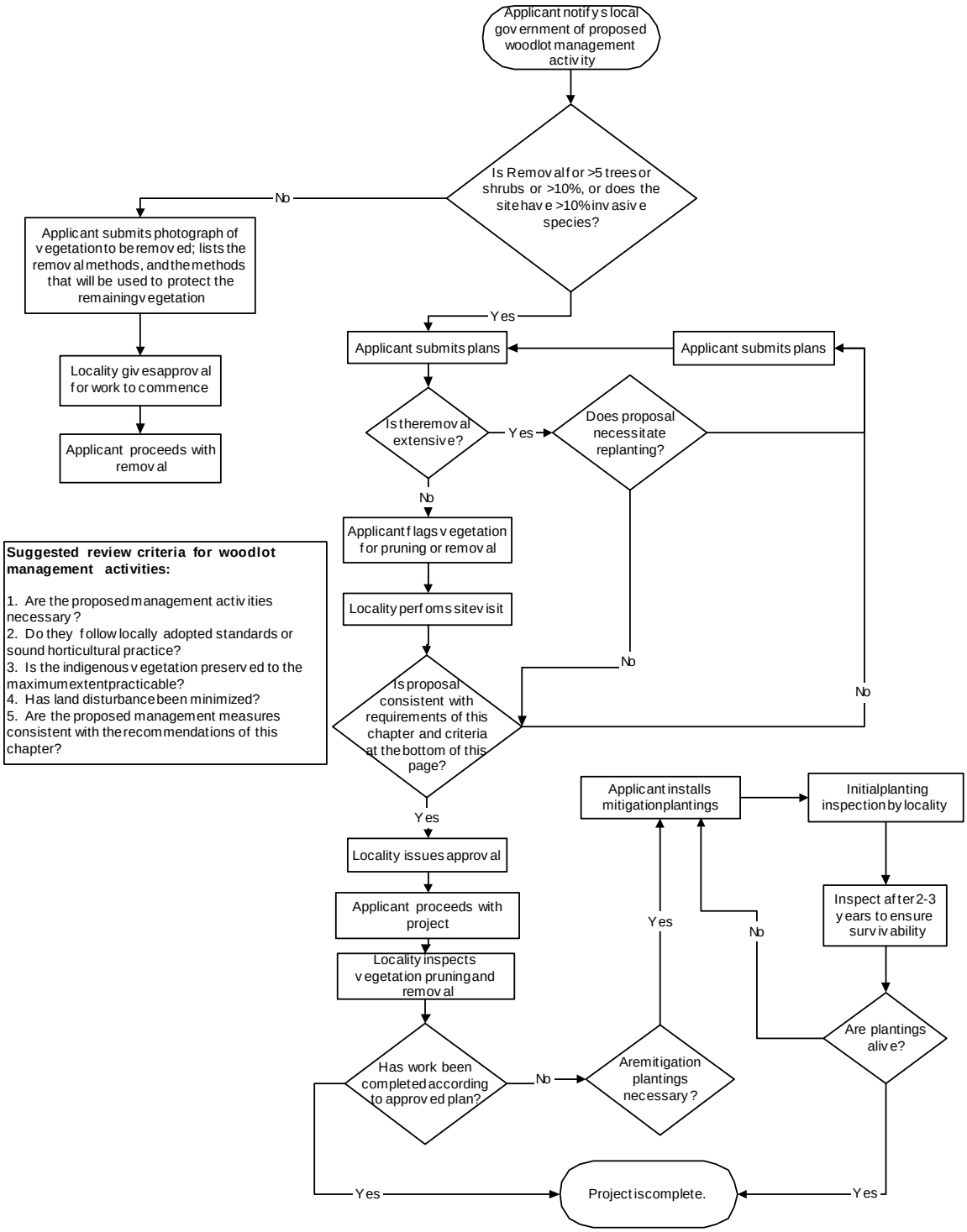
1) A simple administrative approval, without a site visit, may be appropriate for the removal of 1-5 dead, dying, diseased or storm damaged trees and/or large shrubs or removal of an invasive species such as honeysuckle if it covers less than approximately 10% of the site.
   a) Pictures showing the tree(s) or shrub(s) to be removed and the location within the buffer should accompany the request.
   b) Methods for removal should be discussed as part of the application to minimize disturbance within the buffer.
   c) Methods for preserving the remaining vegetation should be discussed as part of the application.
   d) A written approval should be issued specifying the particular tree(s) or shrub(s) to be removed
2) A site visit by local government staff is advised before any request to remove more than five trees or shrubs, or large areas of invasives, from the buffer is approved.
   a) The application should include a plan that shows the name and location of plants to be pruned or removed.

b) Protection methods for the remaining vegetation should be included in the plans for removal.
c) All plants that are to be removed should be flagged before the site visit.
d) The visit should verify the condition of the plants to be removed (that they are dead, dying, or diseased).
    i) Protection plans should be evaluated prior to any vegetation removal to assure the survival of the remaining vegetation.

3) After removal of the approved vegetation, staff should make a site visit to assure that the plans have been followed.
    a) For those local governments that have the authority to require a performance guarantee, and do so as a matter of practice, one may be required to assure the implementation of replacement plantings in the next planting season, when the removal takes place outside of the planting season.
4) For thinning operations, the local government staff should verify that thinning is the only viable method to maintain the health of the forested buffer. Evaluation by a professional arborist or forester is recommended.
    a) An application should include the size, type, and location of all trees to be removed.
5) If the buffer is overrun with invasives and a complete removal and restoration is proposed, the application should include a restoration plan. See *Chapter 5: Buffer Establishment* for restoration procedure.

For additional information on suggested native plants, and planting techniques, see Appendices *A* and *C*. For information on suggested vegetation replacement standards, see *Appendix D*.

Recommended local review and approval process for woodlot management activity



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[5] Castelle. p. 5.

[6] Washington State Department of Ecology. "Chapter 3" p.1-2.

[7] Washington State Department of Ecology. "Chapter 3" p. 6.

[8] Washington State Department of Ecology. "Chapter 3" p.6.

[9] Klapproth, J. C. & Johnson, J. E. (Oct. 2000). *Understanding the science behind riparian forest buffers: Effects on plant and animal communities.* Publication Number 420-152. Virginia Cooperative Extension, Virginia Tech. <http://www.ext.vt.edu/pubs/forestry/420-152/420-152.html>. p. 8-9.

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